

Patent  
Attorney Docket: LYNN/0083

### REMARKS

Claims 1-40, 43-53 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the Bouzek article applied as of record in view of U.S. Patent No. 5,217,584 issued to Deininger. As the Examiner has determined, the Bouzek article does not disclose that the aqueous hydroxide solution comprises a mixture of at least two hydroxides as it uses either sodium or potassium hydroxide. (Office Action, p. 2, ¶ 3). The Examiner further determined that Bouzek does not disclose the use of an alkaline earth metal hydroxide as well as the concentration of the mixture of the hydroxides, electrode and the superimposed current over the DC current. (*Id.* at ¶ 4).

Deininger discloses a *chemical* method and apparatus for the production of ferrates. Deininger discloses that the process requires that a chlorinated caustic solution which contains a strong alkali metal or alkaline earth metal hydroxide, preferably potassium hydroxide, be present in the oxidizing reactor in order to produce the alkali metal or alkaline earth metal ferrate product. (Deininger, col. 5, lines 3-15).

Applicant claims *electrochemical* methods that comprise, *inter alia*, providing an aqueous hydroxide solution in fluid communication between a sacrificial iron-containing anode and a cathode, wherein the aqueous hydroxide solution comprises a mixture of at least two hydroxides. (Independent claims 1, 30 and 53).

To establish a *prima facie* case of obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 985 (CCPA 1974). All words in a claim must be considered in judging the patentability of that claim against the prior art. *In re Wilson*, 424 F.2d 1382, 1385 (CCPA 1970).

An additional requirement for providing a *prima facie* case of obviousness is that the Examiner must provide a basis for combining or modifying the cited references. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680 (Fed. Cir. 1990).

Applicant respectfully asserts that a *prima facie* case of obviousness has not been presented because the cited prior art, either alone or in combination, does not disclose the limitation claimed by Applicant of two or more hydroxides as an electrolyte. The Examiner has determined that Bouzek does not disclose the use of two or more hydroxides. A careful reading of the prior art reference

Patent  
Attorney Docket: LYNN/0083

cited to support using two or more hydroxides – Deininger – shows that Deininger requires that either a strong alkali metal or alkaline earth metal hydroxide be used. Deininger does not disclose, suggest or teach the use of a combination of hydroxides – indeed Deininger *requires* that one and only one hydroxide be used. Deininger discloses a chemical method and requires no electrolyte at all.

Therefore, because the cited prior art references fail to disclose, suggest or teach, either in combination or individually, providing an aqueous solution as an electrolyte comprising two or more hydroxides, Applicant respectfully asserts that a *prima facie* case of obviousness has not been presented. For this reason, reconsideration and withdrawal of the rejection is respectfully requested.

Furthermore, Applicant respectfully asserts that the Examiner has failed to provide any evidence as to why one having ordinary skill in the art would combine the cited prior art references. The *chemical* method disclosed by Deininger is an entirely different process than the *electrochemical* method claimed by Applicant. The reactions that take place are not similar. For example, Deininger discloses the reaction for the disclosed process as requiring a hypohalite and reacting beta ferric oxide to form the ferrate. (Deininger, col. 4, lines 24-40). Deininger also discloses that ferrous ions, nickel and molybdenum are harmful metallic impurities. *Id.* Applicant claims an electrochemical method that includes a sacrificial iron containing anode, which would be harmful impurity in the method disclosed by Deininger. Applicant claims an electrolyte comprising two or more hydroxides and Deininger does not address electrolytes at all since it discloses a chemical method.

Furthermore, the effects of hydroxides in the different reactions are not shown to be the same. Most importantly, Deininger *requires* that only *one* hydroxide be used at a time – “The process of the present invention also *requires* that a chlorinated caustic solution which contains a strong alkali metal *or* alkaline earth metal hydroxide, preferably potassium hydroxide, be present . . . .” (Deininger, col. 5, lines 3-8 [Emphasis added]).

Therefore, because the Examiner has failed to provide evidence of the desirability, and thus the obviousness of the combination, Applicant respectfully requests reconsideration and withdrawal of the rejection. Reconsideration and withdrawal of the rejection of independent claims 1, 30 and 53 is respectfully requested as well as the rejection for all claims depending therefrom.

The Examiner has further determined that it would have been obvious to one having ordinary

Patent  
Attorney Docket: LYNN/0083

skill in the art at the time the invention was made to combine the two known compositions of hydroxides unless such combination provides unexpected results. (Office Action, p. 2, ¶ 5). Although Applicant does not believe that the two prior art references can be combined because one refers to an electrochemical process and the other a chemical process that requires the use of only one hydroxide at a time as discussed in the remarks above, Applicant respectfully points out the unexpected results that may be obtained by combining the hydroxides. Such unexpected results are found in FIGS. 6A-6C. FIGS. 6A-6B provide data of ferrate production using only NaOH (FIG. 6A) and only KOH (FIG. 6B). Comparing these results to the results shown in FIG. 6C show the unexpected results of using two hydroxides in combination resulting in a synergistic effect. As disclosed in the specification, FIG. 6C shows that ferrate concentration increased linearly throughout the process at a rate of approximate 1/3 mM per minute and further experiments indicated that this linear production rate held constant for long periods of time providing an average ferrate production rate of 0.34 mM/min. (Specification, p. 20, Example 4). This is a surprising result compared to the production rate shown in FIGS. 6A-6B, which were 0.18 mM/min and 0.03 mM/min respectfully. (Specification, p. 19, Examples 1 and 2).

Therefore, unexpected results are obtained by combining two or more hydroxides in the claimed invention. Reconsideration and withdrawal of the rejection of independent claims 1, 30 and 53 is respectfully requested as well as for those claims that depend therefrom.

Applicant respectfully requests that the Examiner provide evidence to support the assertion that it is well known in the art to superimpose a sinusoidal current over DC and thus would have been an obvious modification because such superimposition is routinely used in the art to provide increased current and thus an increased product. (Office Action, bridging paragraph between p. 2 and p. 3). Such request is made pursuant to MPEP § 2144.03 that puts a burden upon Applicant to seasonably traverse the well known statement during examination or submit to the statement as being admitted prior art. Applicant hereby traverses the statement of the Examiner that such imposition is routinely used in the art to provide increased current and thus an increased product.

Applicant respectfully asserts that all claims are now in condition for allowance and requests that a Notice of Allowance be timely issued. If the Examiner believes that a telephone interview

Patent  
Attorney Docket: LYNN/0083

would expedite the examination of this pending application, the Examiner is invited to call the undersigned attorney at the convenience of the Examiner. In the event there are additional charges in connection with the filing of this Response, the Commissioner is hereby authorized to charge the Deposit Account No. 50-0714/LYNN/0083 of the firm of the below-signed attorney in the amount of any necessary fee.

Respectfully submitted,  
STREETS & STEELE



Frank J. Campigotto  
Attorney for Applicant  
Registration No. 48,130  
13831 Northwest Freeway, Suite 355  
Houston, Texas 77040  
(713) 939-9444